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Transfer and Commercialization of Agricultural Technology

**Some experience in microenterprise
development in West Africa**

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INTRODUCTION

The thrust of the Transfer and Commercialization Program has been to stimulate increases in agricultural production. The transformation of agricultural commodities into value-added products not only broadens market opportunities but also induces efficient use and management of on-farm resources for sustainable agriculture.

The development of microenterprises has been facilitated by linking the major stakeholders, particularly farmers, processors, policy makers, researchers, extension workers and other end-users in areas of technology transfer and farm output commercialization.

The purpose of this progress report is to bring to focus the implementation status of the West African Small Grants (WASG) Program. Every effort was taken that grassroots driven proposals were developed involving the beneficiaries both at village (on-farm) and peri-urban levels. Approximately 50 percent of the 1998 funded proposals were submitted by farmers' associations, women's group, and food processors' associations. Those proposals which originated from NARS have also centered on farmers as key partners for implementing projects and deriving benefits.

During the first meeting (30th and 31st May, 1998) of the Regional Technical Committee (RTC), 10 country level projects were approved out of 62 submitted proposals.

During the second meeting of the RTC (on the 12th and 13th of May, 1999), five new projects were approved out of 30 proposals submitted. Initial steps taken to launch the program include, the institutionalization of the projects activities at the national level to enhance ownership and empowerment of the grantees and the establishment of a Memorandum of Understanding with participating countries and mechanisms for the coordination and management of projects.

The outputs of this Transfer and Commercialization Program include: i) linking research and farmers to agro-industries through commercialization of cowpea, oil crops, etc.; ii) income and employment generation, as a result of implementing some of these projects; iii) enhancement in the production of certified seeds; iv) decreasing post harvest losses of tropical fruits (e.g. mango) while creating products for the export market to generate income and employment; and v) capacity building.

I. BACKGROUND

1.1 The Problem

Among the setbacks for moving agricultural development forward has been the lack of incentives to enable farmers to increase production beyond their families' needs.

The weak linkages and orientation of research to its clients, such as responding to the needs of agro-industries, have contributed to the inefficient transformation of research results into value-added products. There is, therefore, the need for the diversification of both agricultural production and products to broaden market opportunities.

In many countries, research has made available productive technological options that could double or triple agricultural production and productivity. However, farmers and other end-users of technology have yet to benefit from results of research that could improve their living conditions.

1.2 Purpose and Goal

The purpose of the Transfer and Commercialization Program is to enable farmers, small-scale processors, the national research and extension systems and other partners to improve their efficiency of technology transfer that will lead to microenterprise development. The primary goal of the program is to enable poor resource farmers, micro-processors, etc. to attain food security and generate income and employment in order to better their economic conditions.

1.3 Objectives

The main objectives of the program are to:

- ◆ Identify and enhance the transfer of more productive technologies that are simple and cost effective.
- ◆ Improve the national capacity for assessing socio-economic and technical constraints and opportunities for microenterprise development in agri-business, food processing and transformation.

- ◆ Mainstream gender perspectives in agricultural research and technology transfer to enable women to play a key role in agri-business in general and food security and nutrition in particular.
- ◆ Stimulate demand driven and contract research between beneficiaries and NARS or IARCs for a sustained supply of technology and related services.
- ◆ Document experiences and lessons for developing and managing microenterprises and build a workable development model for adopting agricultural innovations.
- ◆ Strengthen linkages and partnerships between sources of technology supply (such as NARS, IARCs, universities, institutions) and users of technology (such as farmers, food processors, NGOs, private entrepreneurs, traders, financial and policy-making institutions).

1.4 Steps Taken to Launch the Program

1.4.1 Sensitization of the program

Sensitization on the program's concept and objectives took place early January/February 1998 through consultation visits in Burkina Faso, Ghana and Senegal to NARS, farmers' groups, private sector organizations, Universities, Ministries of Agriculture, and extension agents. The activity led to the identification of issues for the assessment of needs and definition of areas for project activities. Guidelines for the submission of small grants were distributed to groups such as NARS institutions, farmers' associations, and food processors.

1.4.2 Fielding of national consultants

Projects were formulated based on a consultant study at the national level. The major issues addressed in the consultant study in each country were the availability of viable technologies and innovations, the extent and use of the technologies, the institutional aspects of technology transfer and commercialization, and the impact of technology on agri-business development.

1.4.3 Institutionalizing the program at national and regional levels

Initial steps undertaken include:

- ◆ The establishment of a Memorandum of Understanding (MOU) between OAU/STRC-SAFGRAD and respective benefiting countries of the program (i.e. Burkina Faso, Ghana, Senegal and Mali). The MOU defined: the purpose of the agreement; the establishment of the Focal Unit (FU) as the mechanism for coordinating and implementing project activities; the specific roles and responsibilities of partners in the implementation of project activities; channeling and use of approved funds; and reporting and liaising with the regional coordinating entity (SAFGRAD).
- ◆ The establishment of the Regional Technical Committee (RTC). This committee is comprised of NARS' Directors, IARCs through networks, representatives from the private sector, women's groups, universities, micro-processors, etc. Some of the functions of the RTC are to: review and approve grant proposals based on established criteria; monitor implementation of project activities; and provide guidelines to enhance efficiency of the implementation of project activities.
- ◆ The establishment of Focal Units (FU). Within the framework of the above mentioned MOU, Focal Units were established to: coordinate the implementation of projects at the country level; assist groups such as farmers, micro processors, and women's groups in the development of projects as well as to linking NARS research to development; organize national workshops to address issues that affect technology transfer and commercialization; submit biannual reports on project activities to OAU/STRC-SAFGRAD; undertake new initiatives and research for developing markets and facilitating the cost of production of agricultural technologies (including food processing) to improve competitiveness in local and international markets; and organize training, as well as the promotion of agri-business.

At the regional level, OAU/STRC-SAFGRAD coordinates and follows up the implementation and management of project activities. Some of SAFGRAD's other responsibilities include the disbursement and management of grant funds, and the facilitation of program reviews and evaluations.

2.1 Towards Commercialization of Cowpea Production

In West and Central Africa, cowpea is not only a major source of protein in the basic diet of millions of households, but are also an important link for integrating crops and livestock production to enhance sustainable agriculture. Annex 2 depicts the partnerships formed through a cooperative agreement between INERA/SAFGRAD/NESTLE and the University of Ouagadougou. Among the farmers' association, (Association Song-Koaadba - ASK), ninety-five members cultivated cowpea and benefited from this project. To enhance the commercialization of cowpea, several studies were conducted related to cowpea cost of production and marketing. These studies, which involved large number of farmers in the project, are described below.

2.1.1. The effect of extension service and availability of input on cowpea yield

This project was implemented in Taptenga, 30 to 40 km N.E. of Ouagadougou. The study structured farmers into three groups of 25. The first group of farmers received both extension services and inputs, the second group received the same amount of inputs as the first group without extension services, and the third group operated outside project support. As shown in Figure 1, the group of farmers who received both extension services and inputs had 200 percent higher yield of cowpea compared to national average yield of 400 kg/ha (Figure 1). Those farmers receiving only inputs obtained yields 187 percent higher than the national average.

The third group of farmers, who operated outside the project, apparently communicated with their neighbor farmers who participated in the project. The study showed there has been a spill over technology between farmers. Their cowpea yield was only about 30 percent lower than the groups who benefited from inputs and extension services, but well above the national average.

The use of organic manure apparently was significantly higher with farmers who had no access to chemical fertilizers. In fact, farmers who received chemical fertilizers did not use any organic manure in their cowpea fields.

1.5 Partnerships

Strengthening partnerships is an important strategy in linking research to development. Stakeholders of each project, in general, involve NARS, extension, women's groups, farm associations, micro-processors, the private and public sectors, such as universities, NGOs, as well as regional and international organizations. The specific roles of partners for each project were identified.

1.6 Criteria for Screening Proposals

The main criteria used in screening proposals relate to:

- ◆ Generation of income and employment
- ◆ Demand for technology/market availability
- ◆ Enhancement for the development of sustainable agriculture
- ◆ Improvement of the nutritional level of households
- ◆ Promotion of agribusiness
- ◆ Increasing agricultural production and productivity to meet food security and the production of primary raw materials for agro-industry
- ◆ Existence of matching/Revolving funds

II. Projects

At the Regional Technical Committee meeting that took place in May 1998, ten projects were approved from 62 proposals on a competitive basis using the established criteria described above and shown in Annex 1.

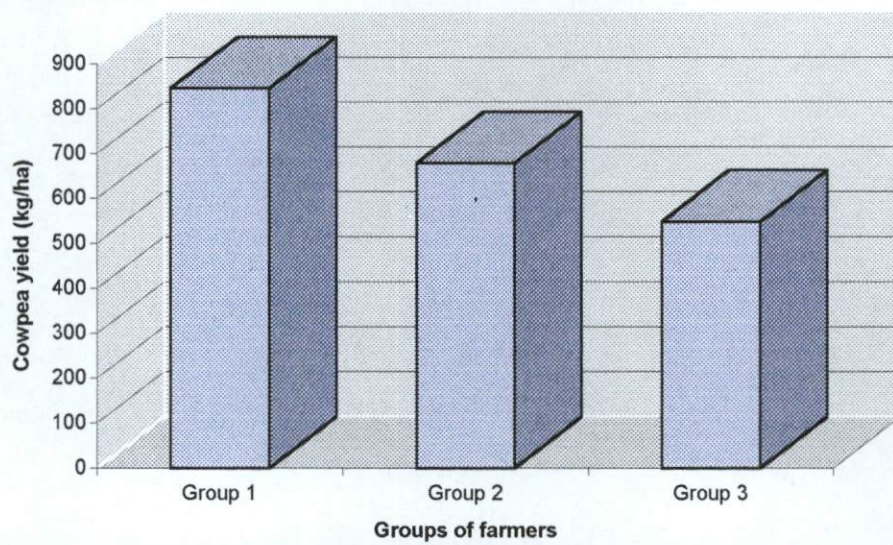


Fig. 1 : Effect of extension service and input on cowpea yield in Taptenga (1998/1999), Burkina Faso

Legend:

Group 1: Received extension services and inputs

Group 2: Received only inputs without extension services

Group 3: Outside the project support



Fig.2 : Production technology package played key role in the increase of cowpea production and commercialization in Burkina Faso in 1998/1999

Above : Cowpea field during the cropping season

Below : Farmers bringing cowpea to the cooperative at harvest

2.1.2 Cowpea as an important crop in the diversification of farm cash income

Revenue from cowpea sales represented an important share of farm cash income. As shown in Figure 3A, the contribution of cowpea to total cash income from farm sources in 1997/98 was 14 percent, compared to 47 percent for market gardening, and 30 percent for cereals. Figure 3B illustrates, as a lower bound, how cowpea production has impacted income diversification. Data from 1998/99 are only available for cowpea income. However, if it is assumed that income from other crops remain at their 1997/98 level, then the cash income contribution of cowpea would increase in 1998/99 to 29 percent of total household cash income, while cash income from market gardening and cereals would decrease to 32 percent and 20 percent respectively.

Farmers usually do not sell most of their cowpea production right after harvest. Some dispose their cowpea three to five months after harvest. The market price of cowpea varied from 125 to 250 F CFA per kg during harvest and four months later.

The income generated from cowpea depends on the period of its market disposal. For the group of farmers receiving inputs and extension services, the net income from cowpea when sold at harvest time was about 80,000 F CFA (\$142) per ha compared to 162,000 F CFA (\$293) per ha when sold three to four month after harvest (see Table 1 and Figure 4). Based on the time of cowpea sales, similar trends in income generated were observed for the group of farmers receiving inputs only and the group of farmers receiving no project support. Those farmers who received neither inputs nor extension services generated relatively low revenue from cowpea production, but doubled their earnings if they sold their cowpea four months after harvest.

As stated earlier, the production and commercialization of cowpea started in 1995 through a cooperative program of SAFGRAD/NESTLE/INERA. The implementation of the USAID supported TTG program has however enabled farmers to enhance cowpea production as an important source of income for on-farm resource diversification as evidenced in 1998/99 farm income activities in Taptenga.

Some of the conclusions of the above studies are as follow:

- ◆ It was substantiated that extension services and availability of inputs and market information are significant in determining the yield of cowpea. The study also showed that when inputs are handled by farmers without extension advice, he/she tends to use a little less than the

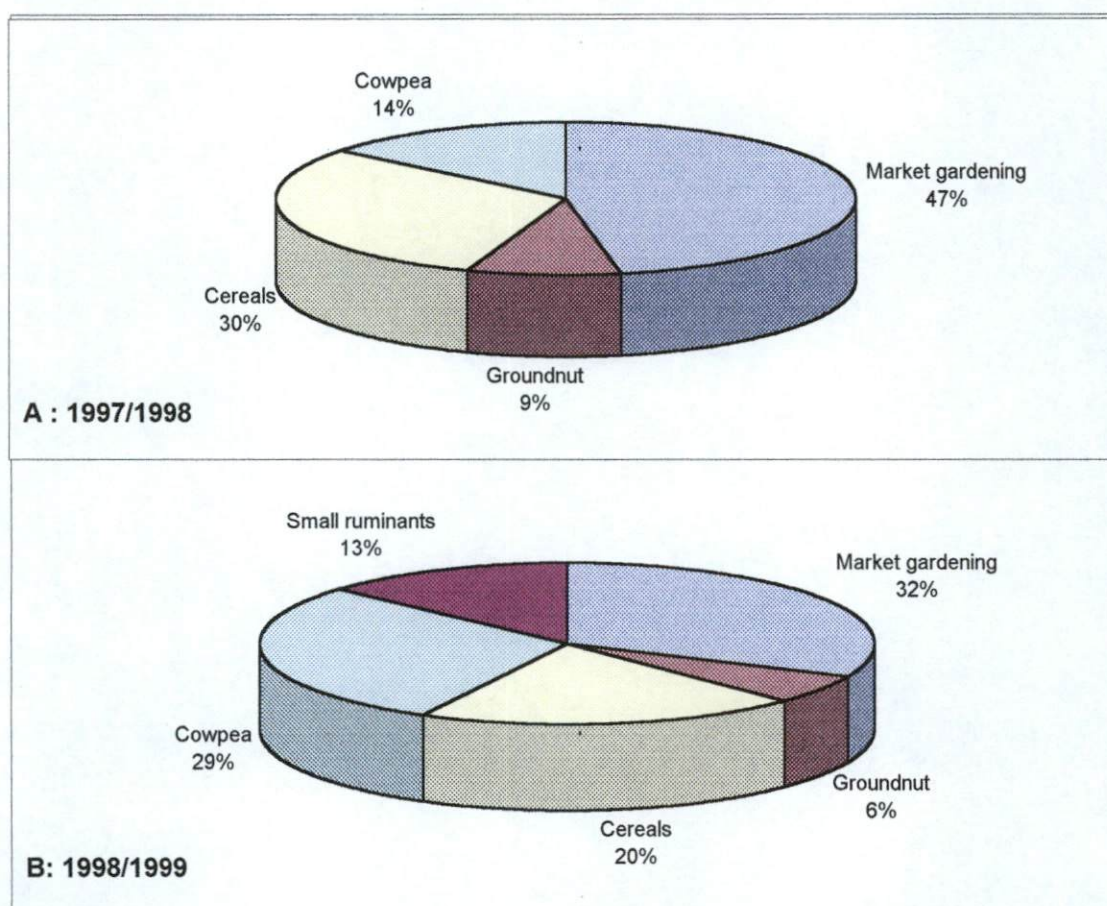


Fig. 3 : Diversification of income of farmers in Taptenga area of Burkina Faso

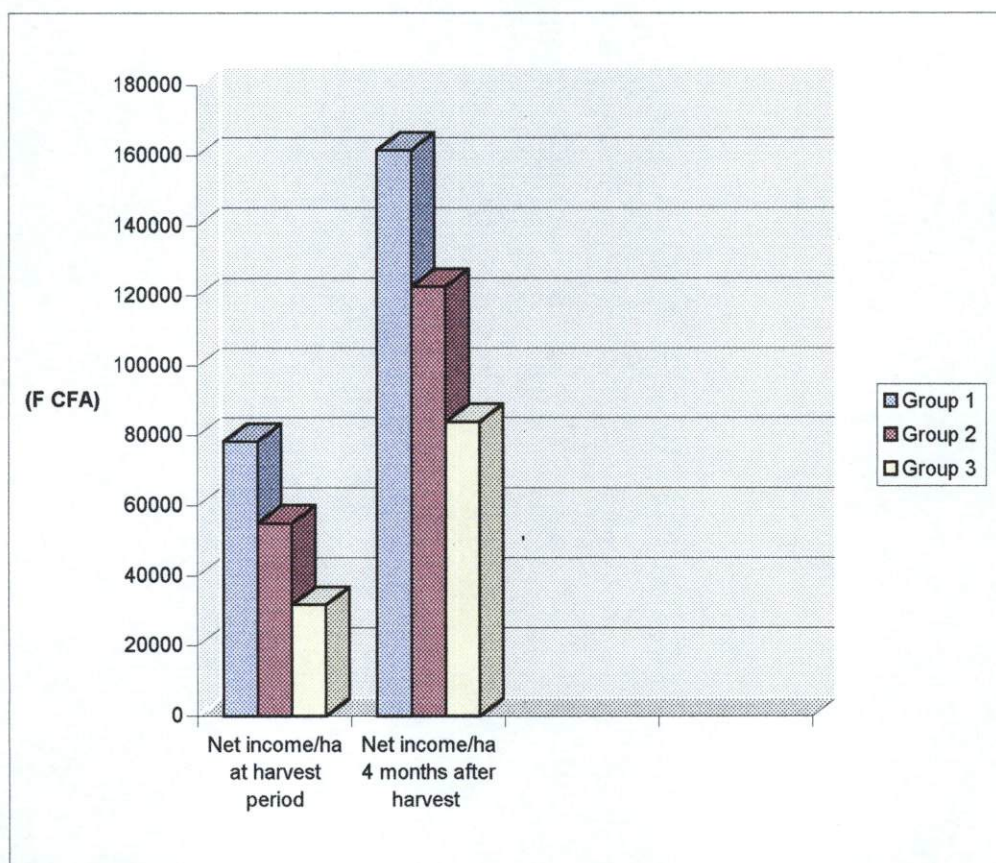


Fig 4 : Effect of extension services, inputs, and time of market disposal on cowpea income in Tabtenga (1998/1999), Burkina Faso

Legend:

Group 1: Received extension services and inputs

Group 2: Received only inputs without extension services

Group 3: Outside the project support

recommended rate for cowpea, saving the remaining amount for use on cereals and vegetables.

- ♦ Farmers who received chemical fertilizers did not use any organic manure in their cowpea field. The use of organic manure is significantly higher for farmers who did not receive chemical fertilizer.
- ♦ Results indicate a spill over of technology between farmers.
- ♦ Revenue from cowpea depends both on the time it is disposed (marketed) and on whether inputs and/or extension services were provided.
- ♦ The combined enterprise of small ruminants and cowpea not only generates higher income, but also enables the farmer to optimize the utilization of on-farm resources.

Table 1. Income from cowpea marketed at harvest and 3 to 4 months later

Cowpea production alternatives	Yield kg/ha	Income at harvest period (150 F CFA/kg)		Income 3 to 4 months after harvest (250 F CFA/kg)		Change of income
		F CFA	Dollars	F CFA	Dollars	%
Group 1. Farmers who applied inputs (fertilizer + pest protection) and also received extension services	832	78 310	142.4	161 510	293.7	106.24
Group 2. Farmers who applied inputs but did not receive extension services	678.32	54 967	99.9	122 605	222.9	123.00
Group 3. Farmers outside project support	547.68	31 792	57.8	83 980	152.7	164.15

2.1.3 Integration of small ruminants into cropping systems

The commercialization of cowpea production gave the impetus to raise small ruminants not only to diversify income, but also to improve the fertility of the soil. The beneficiaries of this project are 25 farmers of the Association de Song-Koaadba (ASK) who took up sheep fattening. Each farmer bought ten sheep for the fattening trial (Figure 5). A total of 430 sheep/mouton were in



Fig. 5: Use of improved feed to supplement crop residues resulted in fast gain of sheep weight in Burkina Faso

the feed lot trials (250 the first round and 180 the second round). Based on a contractual agreement established between farmers' association (ASK) and regional extension, NARS, the ration of sheep feed lot trial was determined. Improved rations included concentrates, cotton oil cakes, fodder of cowpea, groundnuts and cereal residue. The contract between the regional extension and the farmer's association (ASK) provided veterinary services where sheep were treated weekly for parasites and other diseases.

Farmers sold their sheep not on weight basis, but rather on physical stand. The weight gain of sheep on relatively short period has enabled farmers to take advantage of markets during national and regional holidays.

The combined income generated from small ruminants and cowpea was 195.277 F CFA (\$354.8) ha for farmers who used fertilizer and received extension services.

2.2. Towards the Development of Seed Production Microenterprises

2.2.1 Increasing vegetable oil seed production and processing in Northern Ghana

The implementation of this project has been monitored by the Savannah Agricultural Research Institute (SARI) of the Council for Scientific and Industrial Research (CSIR) of Ghana. The production of soybeans has increased over the last decade. As of 1998, soybean production in Northern Ghana was about 33,000 metric tons (SARI, 1999). Although the potential yield of soybean ranges between 2,000 and 2,500 kg/ha, the average yield of farmers is less than 1,000 kg/ha. Furthermore, farmers have problems selling their production. Soybean is a relatively new crop and is not yet fully incorporated into local diets throughout Ghana.

Through the West African Small Grants Program, SARI has released improved soybean cultivars and agronomic practices to be used by farmers. This project has enabled SARI to link soybean and groundnut growers to vegetable oil mills, such as Bosbel, as a major buyer of oil crops.

The objectives of the project are to: supply farmers with improved varieties of groundnut and soybean seeds which have a high oil content; transfer the technology for increasing on-farm yield; guarantee farmers a market for their production by linking them to vegetable oil mills; and guarantee the oil mills a high quality raw material in required quantities.

The project started in the 1998 cropping season when 122 farmers received seed of improved soybean varieties. SARI provided technical guidance for the preparation of land in July and August, to aid in the cultivation of 54 hectares of soybean grain product in 6 administrative districts. Grain produced was delivered to the Bosbel Vegetable Oil Mill in Tamale. In the Gushiegu-Karaga district, a group of 100 farmers involved in a nucleus farm scheme cooperated with the project and produced another 40 hectares of soybean.

Table 2: Soybean grain production performance by farmers in Northern Region, Ghana, 1998

Districts	No. of farmers	Area cropped (ha)	Expected Production (kg)	Actual production (kg)
Tamale	62	30	24,000	-
Yendi	21	8.4	8,400	150
East Gonja	12	4.8	4,800	1,350
Nanumba	06	2.4	2,400	1,250
West Gonja	12	4.8	4,800	150
Tolon/Kumbungu	09	3.6	3,600	-
Gushiegu/Karaga	100	40	40,000	22,000
Total	222	94	88,000	24,900

The oil mills, including Bosbel Oil Mill, offered a price of 72,800 Cedis per 100 kg of soybeans (about \$32/100 kg). To establish a revolving fund, farmers and the oil mills worked out a plan to deduct a certain percentage from farmers' sales to retrieve investments.

Some outputs of this project include:

- ♦ About 10 tons of certified soybean seed was produced which will be planted to 280 ha the following season.
- ♦ Linkages were established between research, (as source of improved soybean cultivars), farmers, (as growers of certified seed and as producers of raw materials), and Bosbel Oil Mills, (as buyers of oil crops production).
- ♦ Survey shows that soybean, groundnut and cowpea are demanded as important sources of dietary protein by a million Ghanaian households. The demand for soybean in Ghana is estimated to be more than 2000 metric tons.
- ♦ Furthermore, soybean and groundnut cakes, and cowpea fodder are essential ingredients of livestock feed. This market has not been fully exploited in Ghana.

2.2.2 Meeting the demand of onion seed and potato seed tubers in Burkina Faso

Seeds of potato and onion are imported from Europe. Over the last decade, the cost of seed for vegetable crops has substantially increased. In the Ouahigouya area alone, the demand for potato and onion seeds will have increased to 25 000 and 500 kg respectively by 1999/2000 (Figures 6 and 7). The main objectives of the project have been first, to meet the demand for planting material of potatoes and onions; second, to improve income of farmers and seed growers; and third to up-grade improved agronomic practices in the seed production of farmers and seed growers.

The input of the technology transfer program to this seed project has been to enable the seed growers association to produce cultivars of potatoes (variety supper elite) and onions (violet de Galmi et Garango) on one and two hectares respectively to start the process of increasing the seed supply. Furthermore, support was provided to this project to improve the cold storage.

By the year 2000, onion seed production will have increased substantially and will help in closing the gap between seed production and demand. Less seed will be imported as the demand is met in the next two years.

The Association has eleven permanent employees, and may double the number of workers during the peak season. An analysis of the revenue of the Association will be completed soon after the series of planting and seed production cycles are completed. The anticipated gross income is, however, over 28.5 million F CFA (\$56,000) for both crops.

2.2.3 Seed increase of improved millet and early maturing maize cultivars in Senegal

Although several early maturing millet and maize cultivars are available, seeds of improved cultivars for farmers' use are virtually lacking. The public and the private sectors are not encouraged to increase the supply of seeds due to low prices for improved seed and lack of credit for seed growers.

Seed increase of improved cultivars of millet (Souna-3, IBV-8004 and IBV-8001) and of early maturing yellow and white maize cultivars was undertaken.

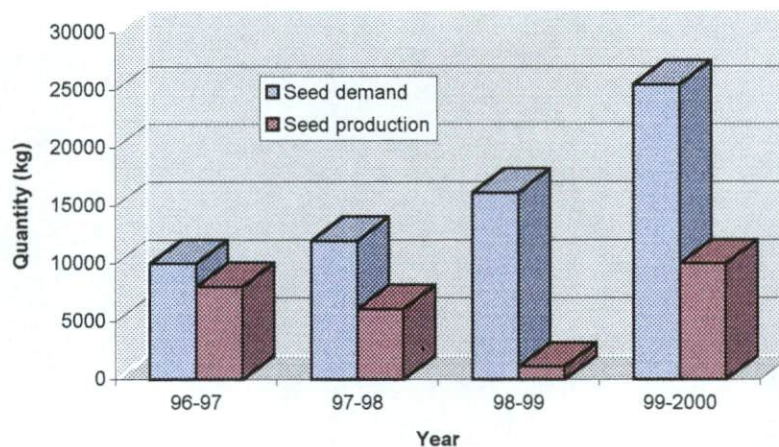


Fig.6: Production and demand of potato tuber seedling for planting, Ouahigouya region, Burkina Faso

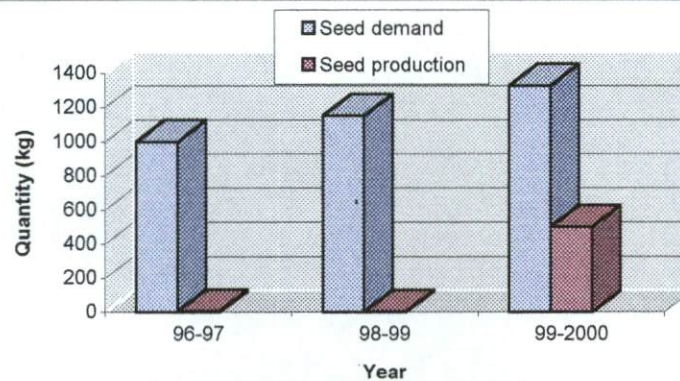


Fig.7: Production and demand for onion seed, Ouahigouya region, Burkina Faso

The seed production unit of the Bambey Research Centre of ISRA, contracted 8 farmers as out growers to increase millet seed production. Out of the total yield of 13.2 metric tons of millet seed produced, 9.5 metric tons of certified seed was obtained (Table 3) and is being sold to groups such as farmers, NGOs, and public agencies. This amount of seed produced is adequate for cultivating 560 ha of millet.

The Increase of yellow and white seeded improved maize cultivars was undertaken by 5 farmers. Out of 10.1 metric tons of improved maize cultivar seed produced, 8.2 metric tons of certified seed was obtained (Table 3). The amount of maize seed produced is adequate for planting 409 ha. Groups such as farmers' cooperatives, private seed growers, and NGOs have purchased the seed for rural development activities.

The outputs of the project include: the increased availability of seeds of improved millet and maize varieties to farmers; the transfer of improved millet and maize production technologies; the improvement of research-farmer linkages; the training of farmers in seed production and technology; the generation of income for farmers and ISRA; and enhancements in the establishment of seed production microenterprises.

**Table 3: Seed production of improved millet and maize cultivars in Senegal
(Bambey Research Center, ISRA, 1998)**

Variety	Production (kg)		Estimated area that can be planted with the produced seed (ha)
	Total	Certified Seed	
MILLET:			
Souna-3	5,712	4,587	270
IBV-8001	2,475	1,637	96
IBV-8004	5,095	3,299	194
Total	13,282	9,523	560
MAIZE:			
JDB	6,516	5,022	251
Synth C	3,225	2,842	142
Early Thai	360	313	16
Total	10,101	8,177	409

Note: Eight farmers were contracted as out growers to produce about 13 metric tons of millet seed and five farmers were contracted to produce 10 metric tons and maize seed.

2.2.4 Community seed production of improved cowpea cultivars in Burkina Faso

One of the major limitations for increasing cowpea production has been the lack of supply of quality seed of cultivars that are disease and insect resistant. NARS of Burkina (INERA), la Direction Régionale de l'Agriculture (DRA) du Centre Sud, and the National Resource Management of Bazega project assisted farmers of the province of Zoundweogo in organizing a community seed production scheme.

The main objectives of the project include: the promotion of cowpea production in the Mossi Plateau; an improvement in the quality of nutrition of the basic diet to aid in the attainment of household food security; and an increase in farmers' revenue accompanied by an improvement in soil fertility.

Seven improved cultivars were introduced and produced in five villages. These include KVx 396-4-5-2-D, KVx 61-1, KVx 414-22-2, KVx 414-22-72, IAR 7/180-4-5-1, KVx39664-Y and KN1 cultivars. Pest control and improved agronomic practices were used.

The direct beneficiaries of the project were 91 farmers (55 women and 36 men) in five villages (Saltouko, Thiougou, Tiakane, Manega and Sagnogo). Community seed production was undertaken and seven cowpea varieties were evaluated (Table 4). Yields of up to 800 kg/ha were obtained in the villages of Thiougou and Manega with cowpea cultivars KVx414-22-2 and KVx414-22-72.

In 1998, fifteen metric tons of certified seed was produced by farmers (Table 4). This is adequate to plant at least 850 ha of cowpea. Farmers have not sold all of the seed they produced, saving some for their own use for planting the following season. In villages where livestock husbandry predominates, dual purpose cultivars such as IAR 7/180-4-5-1 (for grain and forage use) were appreciated.

Table 4: Community seed production of improved cowpea cultivars in Zoundweogo and Nahouri provinces of Burkina Faso

Variety	Yield (kg/ha)*	Total quantity Seed produced (kg)
KVx396-4-5-2-D	563	844.5
KN1	700	700
KVx414-22-2	675.5	2 551
IAR 7/180-4-5-1	438.5	3 709
KVx414-22-72	722.5	4 257.5
KVx61-1	710	1 775
KVx396-4-4	583	1 166
TOTAL		15 003

Source: INERA report 1999

Note: The national average yield of cowpea is about 400 kg/ha.

Preliminary analysis shows that income generation varied among farmers and villages. Farmers in the Manega area generated income ranging from 16,500 to 55,000 F CFA (30 to 100 dollars) per farmer while income ranged from 60,500 to 106,700 F CFA (110 to 194 dollars) at Sagnogo. Relatively high revenue was made at Thiougou, ranging from 27,500 to 143,000 F CFA (50 to 260 dollars) per farmer while relatively low revenue was earned at Siltouko, ranging from 11,000 to 17,600 F CFA (20 to 32 dollars). The other beneficial outputs of this project include the improvement of soil fertility, production and distribution of certified seed to farmers, and training of farmers (both women and men) to produce seed for commercial purposes.

2.3 Capacity Building for Post Harvest and Processing of Agricultural Production

2.3.1 Decreasing post harvest losses of mango fruit to improve the export market in Burkina Faso

Post harvest losses of tropical fruits such as mangoes, range from 15 to 30 percent in the Sahel. Decreasing post harvest losses not only aids in increasing food security, but also enables producers and processors to take advantage of existing markets (Figure 8). The main thrust of this project has been to enable the Women's Association BASNERE (based about 172 km North of Ouagadougou) to improve the capacity to export dry mangoes to Europe (e.g. France, Belgium, England, Germany) and to other markets.



Fig. 8 : Members of the Association Basnere processing mango in Burkina Faso

Above : Cutting and weighing

Below : Packaging

Through the West African Small Grant Program, this Association received funds for four additional drying units and other accessories to improve the capacity for processing and marketing fruits and vegetables. The Food Science and Technology Unit in Burkina Faso has provided technical services and training on quality control. An NGO (ATESTA) provided on-the-job training to local carpenters to construct and install the drying units.

This project has generated income and employment as well as increased the demand for fresh mango by the Women's Association BASNERE. Some of the project's outputs are described below.

- ◆ The capacity for processing mangoes improved since the beginning of the project. As shown in Table 5, the capacity increased from 60 to 110 tons of fresh mango from 1997/98 to 1998/99. The efficiency for transforming fresh to dry mango is about 16.7 percent. This varies slightly by type and uniformity of maturity of the mangoes.
- ◆ The Association's anticipated gross revenue is 40,080,000 F CFA (\$72,872) in 1998 and about 73,480,000 F CFA (\$133,600) in 1999 (Table 5).
- ◆ Employment opportunities for an additional 25 women were created, bringing the level of employment to 65 women (on permanent basis) within the association.
- ◆ Furthermore the Association's demand for fresh mangoes increased by over 50 percent. Occasionally, the Association purchases fresh mangoes from Côte d'Ivoire and Niger.

Table 5: Fresh to dry mango processing (metric tons) and generation of gross revenue by the Women's Cooperative Group BASNERE in Burkina Faso

Year	Quantity (tons)		Gross revenue	
	Fresh	Dry	CFA	Dollars
1995/1996	29	4.869	19 476 000	35,410
1996/1997	28.875	4.822	19 289 000	35,070
1997/1998	60	10.02	40 080 000	72,872
1998/1999	110	18.37	73 480 000	133,600

Source: Women Cooperative Group BASNERE

Notes: The West African Small Grants' support started in 1997/98, which improved the output of the dry-exportable mangoes by over 50%.

From 1995 to 1998 only 4.22% of value has been sold in the national market and 95.78% has been exported.

2.3.2 Promotion of appropriate household and small-scale soybean utilization technologies for selected rural communities in Ghana

The objectives of the project are: to improve the nutrition and income of rural communities; to train rural communities and extension personnel in soybean production, processing and utilization techniques; to determine food consumption patterns, and food preparation techniques in selected communities; and to fabricate appropriate soybean processing equipment for the household level processor and small-scale enterprises.

Baseline studies were undertaken at *Samsam-Odumase* and *Mimpemihoasem*, the two project villages, both in the Greater Accra Region of Ghana. The studies determined the general socio-economic status of the people, their food consumption patterns and food preparation techniques, the nutritional quality of available weaning foods and staple dishes as well as the general nutritional status of the vulnerable group of the population. The study also documented the status of soybean production, processing and utilization in the two villages. While information on the food consumption patterns and food preparation methods was intended to form the basis for product development and recipe formulation activities, the nutritional status studies would also serve as baseline information for future impact assessment studies. The study has established the socio-economic characteristics of the two project villages, and determined the traditional food habits of the people. Household expenditures were also analyzed (Figure 9). Major food crops produced in the area are maize, cassava, yam, plantain and vegetables. The main cash crop is pineapple, which is grown mainly for export. Traditional staple foods for adults and pre-school children are based mainly on the cereals and starchy root and tuber crops while weaning foods are prepared with maize without protein supplementation. Nutritional data obtained from the study indicated that pre-school children in the project area were "at risk" nutritionally and were malnourished (Figure 10). The need for a nutritional intervention was established in the study.

2.3.3 Appropriate canning/bottling systems for training small-scale food processors in Ghana with particular reference to pepper sauce (shittor) producers

It is important to improve the technical skills of women in the processing of vegetables and fruits as small-scale processors. There is the need for training and the acquisition of common canning and processing facilities to generate income and create job opportunities, as well as to aid in decreasing post-harvest losses of tropical vegetables and fruits.

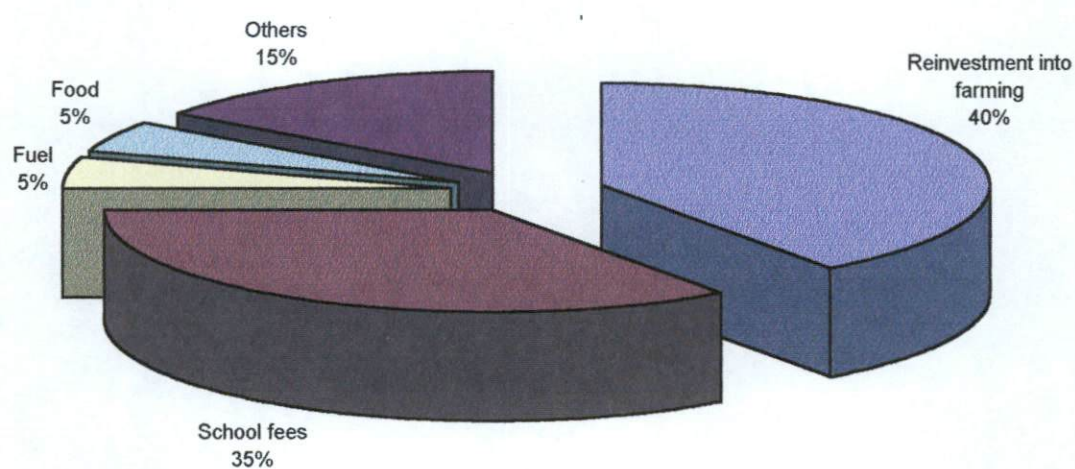


Fig. 9: Household expenditure composition of respondents

Source: Food Research Institute report 1998, Ghana

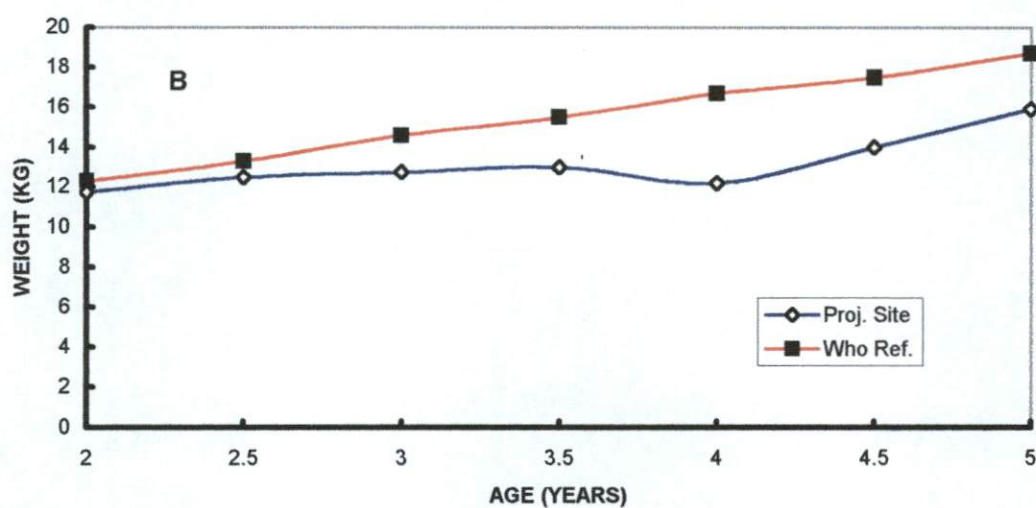
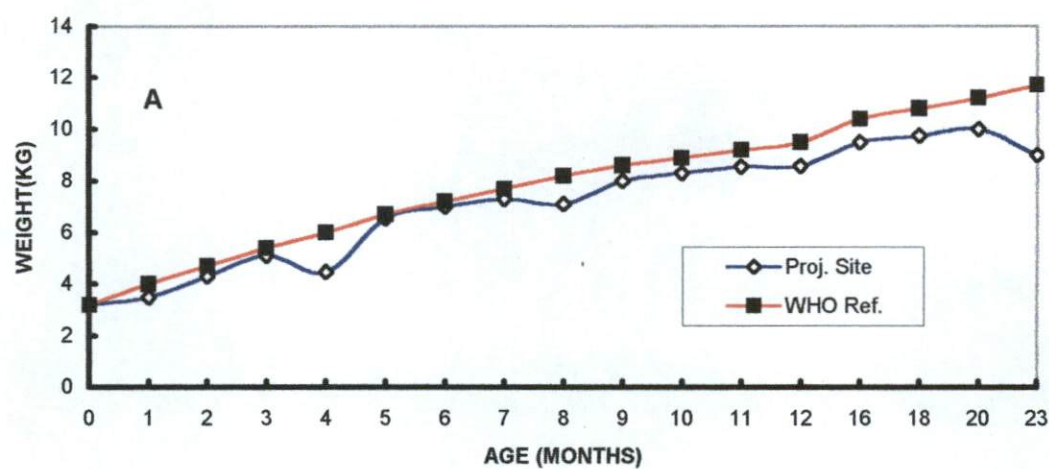


Fig. 10 : Mean weight for age curves for children less than 2 years (A) and children between age 2 and 5 (B)

Source: Food Research Institute report 1998, Ghana

The beneficiaries of this project are 42 registered women members of the Glass Jar Users Association, coming from peri-urban and urban areas. This project involved the dissemination of food processing and preservation techniques as well as packaging and marketing skills.

Important linkages were established between the Glass Jar Users Association, farmers, women's groups, and universities. The Glass Jar Users Association will benefit from technical services from the Food Research Institute, CSIR, and linkages have been established with farmers as suppliers of raw materials and with universities who will conduct research and training. Grants were provided to obtain some essential equipment that was ordered by the Association. This community canning facility will soon start.

2.3.4 Exploitation of vitamin C from *Detarium senegalense* Ditax

The project was initiated in October 1998. Ditax is a forest tree (Figure 11) which is widely distributed in areas such as the Casamance region of Senegal, Guinea Bissau, Gambia. The fruit of Ditax is very rich in vitamin C and has a high demand in Dakar and in other markets. Its fruit is consumed fresh.

The "Institut de Technologie Alimentaire" (ITA) in Senegal has made progress in developing three main products from *Detarium senegalense*. These include a product based on the pulp of the fruit, nectar, and marmalade. The chemical composition of the Ditax fruit is shown in Table 6. The fruit, very rich in vitamin C and sugar, is used to improve the nutritional quality of other products. The plant has also been of great interest and use in traditional medicine.

Table 6: Chemical composition of Ditax based products

Parameter	Pulp	Pulp ITA	Nectar	Compote
Humidity (%)	66.7	84.84	83.93	28.33
Acidity (%)	-	0.14	0.08	0.14
pH	-	3.70	3.47	3.46
Sugar	29.7 g	9.96%	24.36%	-
Vitamin C (mg/100)	1290	422.8	158.77	323.75
Calcium (mg/100)	27	11.59	9.77	9.43
Ash	-	0.54	0.18	0.32

Source: Institut de Technologie Alimentaire (ITA), 1999

The objectives of the project are to develop proper processing and utilization methods to develop Ditax based vitamin C enriched products for the market, to generate income for farmers by domesticating the production of the plant through improved horticultural practices, and to improve the nutrition of both rural and urban households.

Some of the expected outputs of this project include the modern cultivation of the crop, micro-enterprise development based on Ditax products, dissemination of improved agroforestry practices to increase production, and technological development for cost effective transformations of the fruit into value-added products.



Fig. 11 : A Ditax (*Detarium senegalense*) tree in Fatick region, Senegal

Source : 1999 Report, Institut de Technologie Alimentaire, Dakar, Senegal

III. CAPACITY BUILDING

The establishment of the Focal Unit has been cardinal in linking NARS (as sources of technology options) to clients (such as farmers, micro-processors in particular, and agro industries) to improve the transfer and processing of agricultural produce into value-added products, as well as to increase market opportunities. NARS and IARCs are the main sources of agricultural technology and could play key roles in agricultural development. National level capacity building refers to strengthening capabilities of Focal Units to undertake the following activities to:

- ◆ Facilitate technical exchange of information among partners and to address and articulate issues pertaining to utilization, transfer, marketing and commercialization of agricultural technologies.
- ◆ Organize training and workshops to promote the transfer and utilization of research results.
- ◆ Facilitate market studies to create demand for agricultural produce.
- ◆ Promote studies on the cost of production of technologies to enhance competitiveness of agricultural produce.

Annex 6 summarizes the main activities undertaken by the Focal Units in three countries. Being a monitoring and management mechanism of projects at the country level, and also being based at NARS, the lessons learned by establishing these units are:

- (i) The importance of national ownership of projects in management commitment;
- (ii) Empowerment of grantees; and
- (iii) The importance of linking research to clients, such as industry, micro-processors, food science and technology units and farmers.

IV. LESSONS LEARNED

Some of the lessons accrued from implementing this program are :

- ◆ NARS and IARCS, as providers of technology have unfinished work to pursue, for example, in minimizing the cost of agricultural production. Recommendations regarding varieties, hybrids, etc. without studies of the economics of these and related technologies will not lead to competitiveness in African agriculture.
- ◆ Linkages and partnerships of NARS and IARCS with clients, (such as farmers, food processors in particular and agro-industries) in general, are crucial to broaden market opportunities and to promote the transformation of agricultural production into value-added products.
- ◆ The pilot projects at the country level have forged partnerships with specific roles and responsibilities. This participatory approach has facilitated the complementarity of resources and technical know-how in the implementation of projects.
- ◆ Focal Units established in NARS have not only linked research to development but also improved ownerships and the desire to manage country – level projects. Furthermore, regional linkage between the program and Focal Units were facilitated.
- ◆ Having most of the small grants proposals originate from farmers, food processors, marketing agents, not only enhanced the transfer of technology, but also empowered farmers to seek the services from research, extension, veterinary institutes, etc.
- ◆ Contracts between NARS (to supply technology) and farmers' Associations and other users of technology were realized.
- ◆ Contractual agreements between veterinary services and farmers' associations were also established.
- ◆ Income and employment was generated to improve the household economy.
- ◆ This program minimized the hurdles for moving research results to its clients, since forging partnerships brought together stakeholders with specific roles defined.

- ◆ Capacity building has been facilitated to link research to development and to search for market opportunities.

There is, therefore, the need to continue this program not only to reorient research to service clients, but also to enhance the transformation of development support services from public to the private sector, as well as to develop a working model of how this experience can be extended at national and regional levels.

Annex 1: Criteria for screening proposals for West African Small Grants Program in Technology Transfer and Commercialization

Country:	Project						Sub-total Project	Choice of Technology					Sub-total Technology	Total Score
Project Title	Income and employment generation *	Stimulation stackholders partnership	Sustaina- bility	Stimulate contract research/ extension services	Matching/ revolving funds *	Private sector orientation	(6-22)	Demand/ Market *	Contribution to sustainable agriculture *	Food security	Simplicity to transfer	Cost effectiveness/ Availability	(5-19)	(11-41)

Criteria are rated using the following (1-3) scale :

1= Low

2= Medium

3= High

* Criteria marked with asterisk are rated using the following (1-5) scale :

1= Very low

2= Low

3= Medium

4= High

5= Very high

**Annex 2: Partnerships between ASK (Farmers Group Association) and Stakeholders
in Technology Transfer and Commercialization**

Partners	Specific roles	Institutional linkages
ASK-Association	Executive Committee – organizes meetings, implements decisions of members	Association Statutes
INERA (NARS)	Technical services to improve the production of cowpea and small ruminants	Memorandum of Understanding was established between INERA and ASK
NESTLE	Facilitates commercial production of cowpea and purchase of the produce	Protocol d'Accord between ASK and NESTLE through SAFGRAD facilitation
SAFGRAD	Facilitates and coordinates the implementation of the program in cooperation with INERA/NESTLE	Technical cooperation agreement between NESTLE and SAFGRAD
Foundation o John Paul II (NGO)	Financial assistance in the construction of storage and class rooms	Informal working relation
UNDP	Soil-water conservation ASK rented implements	Informal working relation
National Extension System (CRPA, SPRA);	Technical advice in agriculture Veterinary services	Services based in district by the Ministry of Agriculture
INERA And SAFGRAD	Assessment of cost of technology and economic feasibility	SAFGRAD provided resources, monitored the study in collaboration with ASK
PATE CORE (NGO)	Provides materials for soil-water conservation	Informal working relation
SAARAUD	Training in management of projects	Informal working relation
CNCA (agricultural loan society)	Credit for agricultural equipment	Credit agreement
Centre de formation des Catéchistes de Donsé	Consumer of agricultural products	Contract for purchasing cowpea

Annex 3: Brief description of West African Small Grants project activities, Burkina Faso

Project title	Beneficiaries	Technology packages	Status of Implementation	Outputs
1) Commercialization of cowpea production	95 farmers of the Association Song-Koaadba (ASK)	4 improved cowpea cultivars, pest control, post-harvest handling and marketing	95 farmers produced cowpea on ½ hectare each. Study on technology transfer approaches was completed.	i) Generation of income ii) Seeds of improved cultivars disseminated iii) Integration of small ruminants iv) Spill over of technology was evident
2) Commercial production of potato and onion seeds	12 private seed growers based in Ouahigouya (Association of Horticultural Seed Producers of Yatenga)	Improved variety of potato (super Elite) and onion (violet de Galmi et Garango)	2 hectares of improved onions and one hectare of potatoes were grown. Bulblets of onion and tubers were harvested and stored and then replanted. Cold storage space was improved through the project support.	i) Dissemination of 10 tons of potato planting tubers and 500 kg onion seeds. ii) Increased production of potatoes and onions iii) Generation of income iv) Establishment of a revolving fund
3) Integration of small ruminants and crop production	25 farmers of the Association Song-Koaadba in five villages 30 to 40 km N.E. of Ouagadougou	Improved feed rations Cowpea, groundnut and cereal residue. Veterinary services Sheep purchased by participating farmers	25 participating farmers bought 10 sheep of their own. About 250 sheep were in the fattening trials. Two lots of trial were completed. Farmers are ready to start the third lot of trials. Sheep were sold targeting national and regional holidays.	i) 20 farmers trained on the construction of animal sheds, preparation of rations, and in animal health management ii) Diversification of revenue iii) Improved fertility of soil iv) Integration of crop and livestock production v) Community dissemination of technology
4) Post harvest processing and drying fruits and vegetables for export and local markets	Women's Association BASNERE comprised of 40 members based in Ouahigouya	New drying units using gas, sanitation, quality control and grading of mango fruits	Four drying units were installed, drying trays were provided	i) Training local carpenters ii) Fresh mango processing capacity improved by over 50%, from 50 to 110 tons of fresh mangoes iii) Additional employment opportunities for 25 women iv) Income generation v) Increased exports
5) Community seed production of improved cowpea cultivars	91 farmers (55 women and 36 men) in the Zoundweogo province	Seven varieties of cowpea Fertilizer and pest control measures Post harvest storage technique	Certified seed of seven varieties produced. The variety IAR-7/180-4-5-1 was successfully introduced as dual purpose cultivar, and over 15 tons of seeds were produced.	i) Certified seed made available to farmers ii) Training of 91 farmers in seed production iii) Generation of income iv) Soil fertility improvement

Annex 4: Brief description of West African Small Grants project activities, Ghana

Project title	Beneficiaries	Technology package	Status of implementation	Outputs
1) Increasing vegetable oil seed production and processing in North Ghana	About 200 farmers in seven districts in Northern Ghana, oil mills, Savannah Agricultural Research Institute of CSIR	Certified seed of improved soybean varieties, pest control and agronomic practices	Initially, 122 farmers were assisted in the production of soybean seed on 54 ha. Another 100 farmers were contacted to cultivate soybeans in a seventh district in Northern Ghana. Soybean seeds sold to Bosbel vegetable oil mills.	i) About 10 tons certified seed produced for farmers' use ii) Transfer of seed production technologies to farmers iii) Income generation iv) Linkages to oil mills established
2) Promotion of appropriate household and small scale soybean utilization technologies for selected rural communities in Ghana	Rural communities in Ghana: Samsam – Odumase and Mimp-emihoasem villages	Food processing and utilization technique, improved soybean cultivars, appropriate soybean processing equipment and improved agronomic practices	Socio-economic baseline surveys on soybean consumption patterns, food preparation, nutritional status of different age groups, level and trends in soybean production determined	i) Improved nutritional status of households ii) Generated income iii) Enhanced the development of small-scale entrepreneurs in soybean processing
3) Appropriate canning/bottling systems for training small scale food processors in Ghana	Glass Jar Users Association in Ghana comprised of 42 registered members	Food processing and preservation techniques, distribution and marketing skills	Essential equipment ordered, and machines will be installed to start the work	i) Diversified value-added products ii) Created job opportunities iii) Generated income

Annex 5: Brief description of the West African Small Grants project activities, Senegal

Project title	Beneficiaries	Technology package	Status of implementation	Outputs
1) Seed increase of improved cultivars of millet and early maturing maize cultivars	NARS of Senegal (ISRA) and farmers who were contracted as out growers and other farmers who will use the improved seed	Improved millet varieties (Souma 3, IBV-8004 and IBV-8001) and early maturing yellow and white seeded maize-cultivars	The seed production unit of Bambey Station (ISRA) contracted 8 farmers for millet and 5 farmers for maize as out growers. About 13.2 tons of quality millet seed was produced, of which 9.5 tons of certified seed was produced. This amount is adequate for cultivating millet on more than 1200 ha. About 5.0 tons of improved certified maize seed were produced.	<ul style="list-style-type: none"> i) Availability of certified seed to farmers ii) Farmers trained in seed production and technology iii) Improved researcher – farmers linkages iv) Income generation v) Seed production technologies adopted by farmers
2) Exploitation of forest wild trees resources <i>Detarium senegalensis</i> for vitamin C and related products	Farmers, urban households, women's groups involved in food processing and nutrition, and L'Institut de Technologie Alimentaire (ITA)	Collection and chemical characterization of the fruit, high vitamin C based product development procedures, and conservation techniques	Previous studies on the spp. were documented, contacts with farmers in the Casamance areas were established, chemical composition of the fruit established it as a very rich source of vitamin C, and some products were developed.	<ul style="list-style-type: none"> i) Technologies for transforming fruit into value-added products ii) Micro-enterprise development based on ditax products iii) Incorporation of vitamin C in marmelade and juice iv) Creation of demand for products v) Training of food processors vi) Generation of income

Annex 6 : Capacity building for enhancing the transfer and commercialization of agricultural technology

Country	Focal Units (FU)	Workshop	Training	Initiatives taken
Burkina Faso	FU became operational in 1998 Coordination is based at CNRST and links NARS-INERA to monitor implementation of projects; facilitates the transformation of research results into value added products by working with processors, organizing workshops, training, etc.	National workshop was held on 16 th April, 1999 in Ouagadougou, Burkina Faso 30 participants from research, extension, micro entrepreneurs, food science and processing, and development support services attended the meeting Institutional, technical and socio-economic constraints to technology transfer were identified and solutions to various constraints were proposed Theme: "Problématique de la valorisation des résultats de la recherche" The committee was established to follow the implementation of the recommendations	Over 100 farmers were trained in modern production of cowpea (use of pest control, improved cultivars, etc.) 20 farmers were trained in animal health, production, construction of animal shed, and feed rations. 25 women were trained in post harvest processing of mango 95 farmers (55 women and 36 men) received training in seed production	SAFGRAD facilitated studies in the commercialization of cowpea production for industrial uses involving the University of Ouaga, INERA, etc ; Focal Unit played a key role
Ghana	Became operational in 1998 National Coordinator monitors the implementation of country level projects Serves as Secretariat to National Stakeholders Committee Links CSIR (NARS) to clients Facilitates development of proposals, organize workshops, training etc.	Workshop took place on 20 and 21 st April, 1999 in Accra, Ghana where 43 participants from the public and private sectors including research, extension, the Ministry of Food and Agriculture, food processors attended Theme : Prospects for small scale enterprise development in Ghana Social, technical, and institutional problems encountered in the enhancement of technology transfer were discussed Manpower training, accessing market information, and credits were recommended	Community seed producers were helped to produce quality seed of oil crops 122 farmers were assisted to produce soybean with emphasis on the use of improved cultivars and proper agronomic practices to produce quality raw material for vegetable oil mills	Studies on the poultry industry related to feed requirements, particularly to use locally grown crops to create demand for maize or sorghum
Senegal	Became operational in 1998 Based at ISRA headquarters Monitors project implementation, promotes technology utilization with farm associations, women's groups, etc. Links ISRA agric. research units to users of research results. Organizes training, workshops, etc.	National workshop was held on 10 and 11 May, 1999 in Dakar, Senegal at ISRA Theme : Transformation and commercialization of agricultural produce Technical, social and institutional constraints were identified and their solutions were proposed Committee was established to synthesize the deliberation of the workshop	13 farmers were trained in seed production and technology Training of food processors	Technical assessment for the commercialization of millet production (study completed) Assessment for animal feed production in Senegal (based on yellow maize)

**Annex 7 a : WEST AFRICAN SMALL GRANTS FOR THE TRANSFER AND COMMERCIALIZATION
OF AGRICULTURAL TECHNOLOGY 1998-2000
PROJECT SUMMARY – BURKINA FASO**

Project title	Location	Beneficiary organisation	Numbers of members			Number of beneficiaries			Grant	
			M	F	Total	M	F	Total	US dollars	F CFA
1. Cowpea production and commercialisation	Donsin, department of Loumbila	Association Song-Kooadba (ASK)	1072	1443	2515	93	02	95	12 667	7 600 000
2. Potato and onion seed production and marketing	Ouahigouya	Association des producteurs semenciers du Yatenga (APSY)	11	0	11	11	0	11	19 900	11 940 000
3. Fruit and vegetable drying and marketing	Ouahigouya	Groupement féminin Basnéré	0	40	40	0	40	40	14 847	8 910 000
4. Integration of small ruminants and crop production	Donsin, department of Loumbila	Association Song-Kooadba (ASK)	1072	1443	2515	25	0	25	12 470	7 500 000
5. Community seed production of cowpea varieties	Zoundweogo and Nahouri provinces	2 women's groups and individual producers	-	-	-	36	55	91	20 000	12 000 000
6. Capacity building	-	CNRST (Science and Technology Center) MESSRS	-	-	-	-	-	-	20 000	12 000 000
TOTAL									99 884	59 950 000

Funded by USAID through AFR /SD/PSGE

**Annex 7 b : WEST AFRICAN SMALL GRANTS FOR THE TRANSFER AND COMMERCIALIZATION
OF AGRICULTURAL TECHNOLOGY 1998-2000
PROJECT SUMMARY - GHANA**

Project title	Location	Beneficiary organisation	Grant	
			US dollars	CFA
1. Increasing vegetable oil seed production and processing in Northern Ghana	Tamale	Savanna Agricultural Research Institute (SARI), Farming communities, Women NGO	18 000	10 800 000
2. Promotion of appropriate household and small scale soybean utilization technologies for selected rural communities	Southern Ghana	Food Research Institute (FRI), Soybean micro-processors and producers	21 000	12 600 000
3. Community canning/bottling system for training small-scale food processors in Ghana	Accra	Glass Jars' Association	27 000	16 200 000
4. Processing and marketing of micronutrient enriched soybean flour and by-products *	Accra	Food Research Institute, Delabac Ventures, Darkruby Enterprise	20 000	12 000 000
5. Improving the income generating ability of women groups in small ruminants production *	Greater Accra, Northern, Upper West	Animal Research Institute (ARI) and Women groups	15 000	9 000 000
6. Intensification of vegetable production *	Upper-West Region	Savanna Agricultural Research Institute (SARI) and farmers	15 000	9 000 000
7. Capacity building		CSIR	20 000	1 200 000
TOTAL			136 000	70 800 000

Funded by USAID through AFR/SD/PSGE

* Projects approved as of May 1999.

**Annex 7 c : WEST AFRICAN SMALL GRANTS FOR THE TRANSFER AND COMMERCIALIZATION
OF AGRICULTURAL TECHNOLOGY 1998-2000
PROJECT SUMMARY - SENEGAL**

Project title	Location	Beneficiary organisation	Numbers of members			Number of beneficiaries			Grant	
			M	F	Total	M	F	Total	US dollars	CFA
1. Seed production of improved maize and millet cultivars	Bambey	ISRA and cereals producers	-	-	-	-	-	-	16 667	10 000 000
2. Valorisation of a wild fruit in Senegal	Dakar	Institut de Technologie Alimentaire (ITA), micro-processors	-	-	-	-	-	-	16 667	10 000 000
3. Mango and fruits drying *	Ndame Lo	Women association	0	150	150	150	150	150	7 910	4 745 000
4. Seed production of improved millet cultivars *	Medina Sabakh	Producers association	17	03	20	17	03	20	25 333	15 200 000
5. Capacity building		ISRA							20 000	1 200 000
TOTAL									86 577	41 145 000

Funded by USAID through AFR/SD/PSGE

* Projects approved as of May 1999.

**Annex 7 d : WEST AFRICAN SMALL GRANTS FOR THE TRANSFER AND COMMERCIALIZATION
OF AGRICULTURAL TECHNOLOGY 1998-2000
PROJECT SUMMARY - TOGO**

Project title	Location	Beneficiary organisation	Grant	
			US dollars	F CFA
Valorisation of results transfer of mobile grater and power press to women's organization for processing cassava into gari	Southern Togo	2 Women's associations (Groupement Wogba and groupement Lolonyo)	13 333	8 000 000
TOTAL			13 333	8 000 000

Funded by USAID through AFR/SD/PSGE



Participants at the national Technology Transfer and Commercialization Workshop, and the Second Regional Technical Committee Meeting held in Dakar, Senegal on May 10-14, 1999

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